COLORADO RIVER RECOVERY PROGRAM
FY 2003 ANNUAL PROJECT REPORT

RECOVERY PROGRAM
PROJECT NUMBER: 115

I. Project Title: Cumulative Effects of Flaming Gorge Dam Releases, since 1996, on the Fish Community in Lodore and Whirlpool canyons, Green River.

II. Principal Investigator(s):

Lead Agency: Larval Fish Laboratory, CSU; Bureau of Reclamation; U.S. Fish and Wildlife Service

Jointly Submitted by: Larval Fish Laboratory, CSU; Bureau of Reclamation; U.S. Fish and Wildlife Service

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III. Project Summary: The primary purpose of this study is to determine the cumulative effect that flow and temperature regimes have had on the fish community in Lodore and Whirlpool canyons of the Green River and recommend how to monitor effects into the future. A secondary purpose is to determine the distribution of the humpback chub population in Whirlpool Canyon to serve as the basis for future monitoring efforts. Future monitoring (i.e. population estimation), if deemed necessary, will be needed to evaluate the contribution of the Whirlpool Canyon population of humpback chub to the overall recovery of the species. Information gathered will be used to evaluate whether flow and temperature regimes from Flaming Gorge Dam are benefitting endangered fishes in the Green River without causing adverse changes in abundance of non-native fishes.

IV. Study Schedule: 2002-2004.

V. Relationship to RIPRAP:

Green River Action Plan: Mainstem.

II.D. Evaluate and revise as needed, flow regimes to benefit endangered fish populations.

VI. Accomplishment of FY 2003 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1: Set and maintain thermographs.

Thermographs were set in the upper portion of Browns Park and just above Lodore Canyon. This data will supplement that being gathered by George Smith, U.S. Fish and Wildlife Service, Denver, and by Dr. Mark Vinson, Utah State University, at up to 10 other localities in the Green River. The Green River upstream of the Yampa River again experienced a very warm thermal regime in 2003, although not quite as warm as 2002. Mid-day water temperatures in mid-July were 25°C or higher and were nearly as warm as the unregulated Yampa River. This was due in large part to low flows from Flaming Gorge Dam, and extremely warm air temperatures.

Task 2: Sample main channel fish community (large-bodied fishes).

2002 sampling.--We captured a total of four Colorado pikeminnow *Ptychocheilus lucius* during July electrofishing sampling and six more during September electrofishing in 2002 (Table 2). Another eight fish were observed but not netted during those two sampling efforts. Additional sampling (mostly angling) in Lodore Canyon in summer 2002 by C. Kitcheyan revealed presence of a relatively large group of adult pikeminnow. Four of ten fish were newly captured fish and were PIT-tagged. Three of the Colorado pikeminnow captured in July were ripe, tuberculate males, including one in Lodore Canyon. We also captured a razorback sucker during September sampling that appeared to be a hybrid with flannelmouth sucker *Catostomus latipinnis*. The hybrid assessment was made based on intermediacy of lateral series scale counts and mouth morphology between the two putative parental species, and the nearly non-existent dorsal keel. The fish had a PIT tag in it at capture. A scan of the PIT tag database suggested that it had been captured twice previously, but no mention was made that the fish was potentially a hybrid.

Table 1.–Tentative list of fishes captured in the Green River, from Browns Park downstream to Rainbow Park with electrofishing, trammel nets, and seining, 2002-2003. N = native, I = introduced.

	Status	Electrofishing	Trammel netting	Seining
Mountain whitefish	N	X		X
Humpback chub	N		X	
Bonytail	N			X[1]
Roundtail chub	N	X	X	X
Colorado pikeminnow	N	X	X	X
Speckled dace	N	X		X
Bluehead sucker	N	X	X	X
Flannelmouth sucker	N	X	X	X
Razorback sucker	N	X		
Mottled sculpin	N	X		X
Cutthroat trout	I	X		
Rainbow trout	I	X	X	
Brown trout	I	X	X	
Northern pike	I	X		X
Red shiner	I			X
Common carp	I	X	X	X
Fathead minnow	I			X
Sand shiner	I			X
Redside shiner	I	X		X
White sucker	I	X	X	X
WS x FM		X	X	
FM x BH		X		
WS x BH		X		
RZB x FM		X		X
Channel catfish	I	X	X	X
Green sunfish	I	X		X
Smallmouth bass	I	X	X	X
Walleye	I	X		

Table 2. Captures of Colorado pikeminnow (CS) and humpback chub (HB) adults during 2002 sampling in the Green River in Lodore and Whirlpool canyons, and Echo and Island parks.

species	date dd	date mm	date yyyy	gear	RM start	RM end	R/L	TL (mm)	weight (g)	recap?	PIT tag #	notes
CS	09	07	2002	EL	351.3	349.7	R	595	1576	yes	7F7D224D6B	
CS	09	07	2002	EL	348.6	347.1	R	590	1645	yes	5318301332	male - ripe, heavily tuberculated
CS	11	07	2002	EL	335.8	334.9	L	562	1323	no	4242351C2E	male - milt, tuberculate
CS	11	07	2002	AN	333.6	333.6	L	544	1182	yes	5326687A03	tuberculate; on Rapala
CS	09	09	2002	EL	362.0	360.9	L	695	2581	no	4242425557	
CS	09	09	2002	EL	358.3	358.2	L	598	1540	yes	7F7B134306	blind left eye
CS	11	09	2002	EL	344.1	342.4	L	525	988	yes	42424A6D3B	
CS	12	09	2002	EL	339.0	338.5	R	536	1274	yes	42424E3358	
CS	12	09	2002	EL	338.2	336.9	R	665	2305	no	53261D6534	
CS	12	09	2002	EL	335.3	334.4	L	583	1566	no	5316014258	
CS	08	10	2002	TR	342.5	342.5	R	520	1109	yes	42424A6D3B	net 3, 1730-1930 hrs
CS	08	10	2002	TR	342.5	342.5	R	520	1109	yes	42424A6D3B	net 3, 1930-2145 hrs
CS	09	10	2002	TR	341.7	341.7	R	505	1155	yes	223F4D1F3B	net 3, 1905-2135 hrs
HB	08	10	2002	TR	342.0	342.0	L	288	183	no	53266A5D6A	net a, 1940-2135 hrs
HB	09	10	2002	TR	341.6	341.6	L	369	390	no	53197A2D12	net 1, 1500-1700 hrs

Unusual fish behavior noted during the July sampling trip prompted us to use one electrofishing raft from U. S. Fish and Wildlife Service, Grand Junction on the September trip, which replaced one of the Vernal, USFWS rafts. The Grand Junction boat sampling efficiency was much higher and it was later discovered that the Vernal boats had wiring problems. This situation was rectified in 2003.

Trammel-netting in 2002 was conducted on two different sampling trips. One of those trips was an additional trip beyond that called for in the proposal to focus on Whirlpool Canyon sampling because the amount of trammel-netting conducted on earlier trips was limited. Trammel-netting yielded two Colorado pikeminnow, two humpback chub *Gila cypha* (Fig. 1), and several other chubs that had morphological characteristics intermediate between *Gila robusta* and *Gila cypha.*

2003 sampling.–We completed two electrofishing trips through the study area in 2003, as prescribed in the study proposal. Flows were low but turbid in July and clear in September. Electrofishing efficiency was much improved over 2002 sampling. This was due to polarity adjustments to electrofishing rafts used for that sampling. A tentative list of the fishes captured by electrofishing, trammel netting, and seining in 2002-2003 is presented (Table 1), along with captures of Colorado pikeminnow and humpback chub (Table 3). Number of fish captures in 2002 seemed qualitatively lower than what was observed in sampling efforts from 1994 to 1996, but higher in 2003.

In 2003 we captured a total of 19 Colorado pikeminnow. Nine of those were from the Lodore Canyon reach, nine were from Whirlpool Canyon, and one was from a seine sample in a backwater in Island Park. Similar to 2002, we again captured tuberculate Colorado pikeminnow in Lodore Canyon in 2003.

In 2003, we also conducted trammel-netting on four different occasions in spring and autumn. Two of those trips were over and above that called for in the scope of work. That sampling was directed primarily at determining the distribution and abundance of *Gila* spp., both humpback chub and roundtail chub, in the study area. Most effort was concentrated in Whirlpool Canyon, and most of that was in September and October. We collected a total of five humpback chubs in 2003, which were similar in morphology to the single humpback chub collected in 2002 (shown below, Fig. 1). An additional humpback chub similar in morphology to the one shown was captured in Whirlpool Canyon by angling but was released prior to being tagged or measured. We also collected and tagged many roundtail chub specimens during 2003 sampling. We plan to attempt an abundance estimate of roundtail chub in order to obtain an index of humpback chub abundance in the study area, based on relative proportion of each species captured during 2003 sampling. The data we report for humpback chubs collected during this study was also provided to the Vernal office of the U. S. Fish and Wildlife Service, because they assisted with aspects of the sampling conducted in this project. They will provide some roundtail chub capture data to us as well, which was collected on two independent sampling occasions.

Fig. 1. Image of a putative humpback chub captured in the Green River, Whirlpool Canyon, September 2002.

Table 3. Captures of Colorado pikeminnow (CS) and humpback chub (HB) adults during 2003 sampling in the Green River in Lodore and Whirlpool canyons, and Echo and Island parks.

	date				RM			TL	weight			
species	dd	mm	yyyy	gear	start	end	R/L	(mm)	(g)	recap?	PIT tag #	notes
CS	21	07	2003	EL	362.0	360.7	L	611	1781	yes	532627674B	RM 361.7
CS	21	07	2003	EL	361.0	359.3	R	604	2254	yes	7F7B134306	blind left eye
CS	21	07	2003	EL	360.7	359.3	L	567	1420	yes	51276570B2	
CS	22	07	2003	EL	354.9	353.7	R	515	1044	no	425A484C50	tuberculate
CS	22	07	2003	EL	348.6	347.2	L	512	1006	no	4242421300	
CS	22	07	2003	EL	348.6	347.2	L	745	3307	no	423E572E2C	female
CS	23	07	2003	EL	347.2	346.2	R	465	827	no	425B081B5F	
CS	23	07	2003	EL	346.2	345.1	R	505	1109	no	425B493656	
CS	23	07	2003	EL	345.2	343.0	L	528	1061	yes	2241161E1C	RM 344.9, GR-YA confluence
CS	23	07	2003	EL	342.0	340.6	L	540	1085	yes	5325565608	RM 340.6
CS	23	07	2003	EL	339.1	338.1	L	706	2973	yes	223F676267	Jones Creek confluence
CS	23	07	2003	EL	338.1	336.3	L	507	1004	no	425B27280A	
CS	23	07	2003	EL	336.9	336.2	R	651	2185	yes	52283D5D59	
CS	23	07	2003	EL	347.2	346.2	R	399	424	no	425A28741D	
CS	24	07	2003	EL	335.7	334.5	L	556	1172	no	425B3E0ED8	
CS	24	07	2003	SE	328.2	328.2	R	485	842	no	425B281F52	
CS	15	09	2003	EL	359.9	358.8	L	574	2040	no	423F6B2539	
CS	18	09	2003	EL	337.3	336.6	L	560	1858	yes	1F40492A2E	
CS	08	10	2003	TR	337.6	337.6	R	581	—	no	5326641F1B	net 6, 1940-2145 hrs
HB	17	09	2003	TR	342.7	342.7	R	250	134	no	4240174151	net 3, 1700-1850 hrs
HB	06	10	2003	TR	342.2	342.2	L	264	139	no	425C183E46	net 4, 2020-2220 hrs
HB	07	10	2003	TR	341.8	341.8	R	252	---	no	425A4A3B3E	net 1, 1815-2035 hrs
HB	08	10	2003	TR	341.6	341.6	L	232	100	no	4269525551	net 5, 0655-0925 hrs
HB	13	10	2003	TR	342.2	342.2	L	263	136	yes	425C183E46	net 4, 1820-2048 hrs

The remainder of the large-bodied fish community appeared qualitatively similar to that documented in 1994-1996 with one exception. The most striking recent change has been the increased distribution and abundance of smallmouth bass captured in the Lodore Canyon reach of the study area. We now find smallmouth bass throughout Lodore Canyon, although they are more abundant downstream, and a wide variety of sizes, including many individuals180 to > 300 mm TL. We detected many smaller size-classes by electrofishing, especially after we used a finer mesh dip net (½" instead of 1") on one electrofishing raft sampling effort in autumn. We also have the first evidence that smallmouth bass are reproducing in Lodore Canyon (see below). Angling in lower Lodore Canyon by our technicians conducting drift net sampling also indicated a substantial population of smallmouth there, because it was not uncommon to capture a dozen or more fish in a short time period. Thus, smallmouth bass appear to be establishing throughout the study area, and particularly in Lodore Canyon. This invasion coincides with two consecutive years of low and warm flows in Lodore Canyon.

Task 3: Sample small bodied fish community.

Over 200 seine samples were collected in the study area from middle Browns Park downstream to the lower end of Rainbow Park during spring, summer, and autumn. We are in the process of identifying those samples. Relatively few fish were collected in samples from Lodore Canyon compared to Whirlpool Canyon.

Small-bodied smallmouth bass *Micropterus dolomieu* were found in backwaters throughout Whirlpool Canyon and are now present in Lodore Canyon in 2003. We captured smallmouth bass in backwater habitat in Lodore as small as 12-20 mm TL in July seine samples, which suggested reproduction by that species in that reach. We also detected many young smallmouth bass in seine samples in Whirlpool Canyon and in the Rainbow-Island Park reach.

We also documented rapid upstream dispersal of red shiners in the Green River. Through summer 2003, and in prior studies in 1994-1996, red shiners were abundant in lower Lodore Canyon, rare or not present in upper Lodore Canyon, and with the exception of a single large specimen, were absent in Browns Park. By autumn 2003, we documented red shiner presence throughout Browns Park from upstream of Swinging Bridge downstream through Lodore Canyon. This represents a range extension of about 30 river miles over a very short time. They were often the most abundant species in seine samples in Browns Park, particularly in backwater habitat. Adult and juvenile size classes were present which suggested successful reproduction by that species in that reach.

Task 4: Sample larval drift and process samples.

Drift samples were collected in the Green River just upstream of the Yampa River from 7 July 2002 until 18 August 2002. A total of 150 samples was collected, which included several diel samples at occasions throughout the summer. In general, fish were few in samples compared to drift net samples collected in the nearby Yampa River. We are

beginning to identify those drift net samples. A substantial find was larvae of smallmouth bass, which was strong evidence for the first documented reproduction by that species in the Green River in Lodore Canyon.

Task 5: Process preserved samples of small-bodied fish (seine hauls).

We have completed identification of most 2002 samples and are progressing with 2003 seine samples. We have noted the presence of several small chubs as well as a few small Colorado pikeminnow from backwaters in Island and Rainbow parks in 2002. Qualitatively, those species seemed less abundant in 2003.

Task 6: Prepare and submit annual report.

This report.

Task 7: Prepare final report (includes incorporation of peer review comments).

Not applicable.

Task 8: submit draft final report to Biology Committee.

Not applicable.

VII. Recommendations: This is supposed to be the last year of sampling for this study before we analyze data and write our report. However, based on new findings about invasive non-native fishes such as smallmouth bass and red shiners, we intend to discuss extending this work with the Biology Committee for at least one and preferably two or three years. We feel that continued sampling is needed to better understand effects of these low and warm flows on the fish community, so that we can make the best assessment of effects of Flaming Gorge flow and temperature regimes. In particular, continued electrofishing sampling would allow us to bolster our information on the large-bodied fish community, which was limited in 2002 due to technical problems with electrofishing gear. Continued sampling would also give us an opportunity to follow the invasion of smallmouth bass in the river and begin to document effects of that species on the native fish community of that portion of the Green River.

VIII. Project Status: Ongoing and on track.

IX. FY 2003 Budget Status

A. Funds Provided: $65,695
B. Funds Expended: $55,615
C. Difference: $10,080, these funds are needed to finish identification of samples collected in 2003.
D. Percent of the FY 2003 work completed, and projected costs to complete: about 75% completed.

E. Recovery Program funds spent for publication charges: $0

X. Status of Data Submission (Where applicable): Copy of data will be sent to the datbase manager in January.

XI. Signed: Kevin R. Bestgen 11 Nov. 2003
Principal Investigator Date